

We claim:

1. A system for circulating lubricant in an assembly, comprising:

a housing adapted to contain a reservoir of hydraulic lubricant;

an aperture in the housing to permit lubricant circulation;

5 a chamber located adjacent the aperture, adapted to hold lubricant therein, the chamber located at a first elevation;

a component supported for rotation partially in the lubricant and partially in a portion of the housing located above the lubricant, having means for moving lubricant from the reservoir to the chamber;

10 a lubricant cooler disposed outside of said housing; and

conduit means having a first end hydraulically connected to the chamber and a second end hydraulically connected to said cooler at a location that is distant from the reservoir and at a second elevation lower than the first elevation, for carrying lubricant from the chamber to the cooler, using gravity to transport lubricant from the first
15 elevation to the second elevation.

2. The system of claim 1 wherein:

the housing includes first and second axle tubes extending outward in opposite directions from the reservoir; and

20 the conduit means includes first and second conduits, the first conduit having a first end connected to the chamber and a second end hydraulically connected to said cooler mounted on the first axle tube of the housing.

3. The system of claim 2, wherein the second conduit has a first end hydraulically connected to the cooler and a second end hydraulically connected to said housing adjacent said reservoir, the second end of the second conduit being located at a third elevation lower than the first and second elevations.

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4. The system of claim 1, wherein said conduit means provides a hydraulic loop from said chamber to said cooler and back to said reservoir.

5. The system of claim 1, wherein the cooler is mounted on an exterior of an axle tube extending from said housing.

6. The system of claim 1, further comprising a valve disposed at said chamber for controlling a flow of lubricant to said cooler.

7. The system of claim 5, wherein said valve is a temperature-sensitive flow control element to control flow based at least in part on the temperature of the lubricant.

8. The system of claim 5, wherein said valve comprises a spring member.

9. The system of claim 1, wherein said component is a ring gear.

10. The system of claim 1, wherein said component is an impeller fixed to a rotatable differential case.

11. A system to dissipate heat from lubricant provide within a differential carrier, said system comprising:

a differential assembly having a lubricant reservoir;

5 a carrier cover plate formed with an oil scrapper/pump outlet provided adjacent a rotating member of said differential assembly;

an oil cooler mounted on an adjacent axle tube; and

a delivery system to deliver lubricant from said outlet to said oil cooler and back to said reservoir,

10 whereby said lubricant is delivered from said carrier through said delivery system to said oil cooler via a gravity feed system.

12. The system of claim 11, wherein said delivery system comprises a first conduit having a first end hydraulically connected to the outlet at a first elevation and a
15 second end hydraulically connected to said cooler at a location that is distant from the reservoir and at a second elevation lower than the first elevation, for carrying lubricant from the chamber to the cooler, using gravity to transport lubricant from the first elevation to the second elevation.

20 13. The system of claim 12, further comprising a second conduit having a first end hydraulically connected to the cooler and a second end hydraulically connected to said reservoir, the second end of the second conduit being located at a third elevation lower than the first and second elevations.

14. The system of claim 11, wherein said oil scrapper/pump outlet forms a chamber on said cover plate, and wherein said delivery system provides a hydraulic loop from said chamber to said cooler and back to said reservoir.

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15. The system of claim 11, wherein the cooler is mounted on an exterior of an axle tube extending from said housing.

16. The system of claim 11, further comprising a valve disposed at said oil
10 scrapper/pump outlet for controlling a flow of lubricant to said cooler.

17. The system of claim 16, wherein said valve is a temperature-sensitive flow control element to control flow based at least in part on the temperature of the lubricant.

18. The system of claim 16, wherein said valve comprises a spring member.
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19. The system of claim 11, wherein said component is a ring gear.

20. The system of claim 11, wherein said component is an impeller fixed to a
20 rotatable differential case.